

Renewable Energy As a Strategy for Visibility Improvement

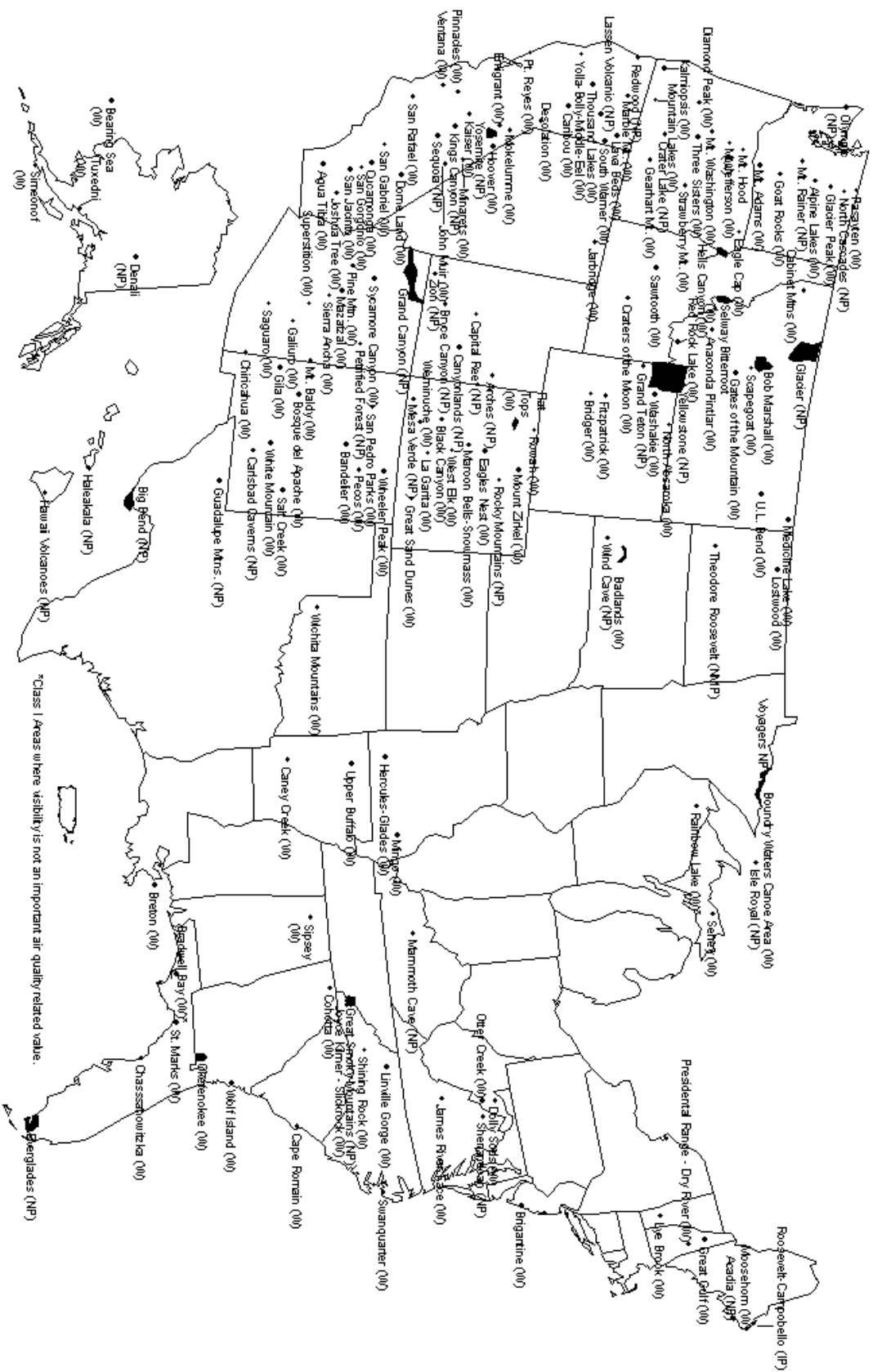
Doug Latimer
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Denver, Colorado



Clean Air Act (1977)

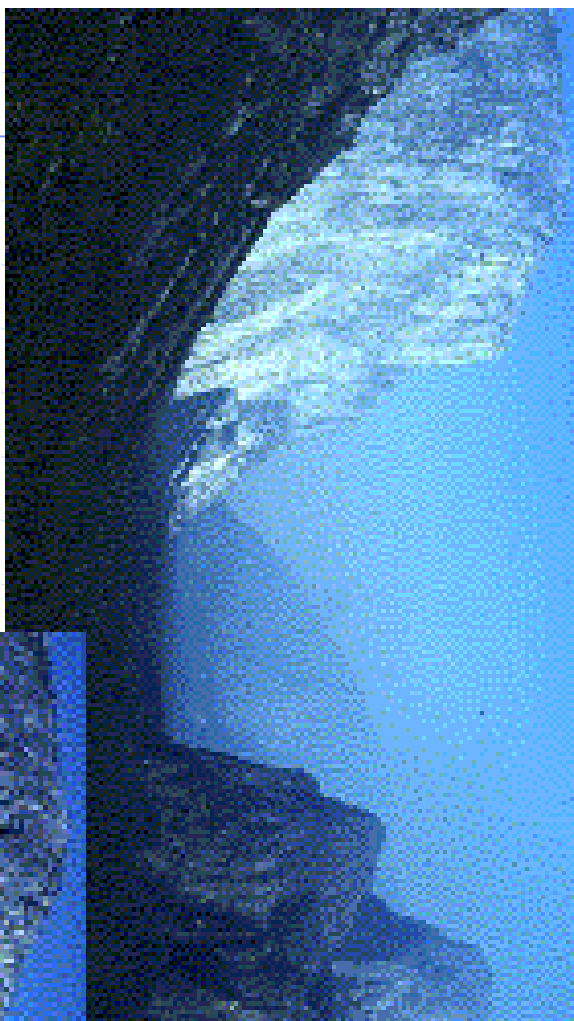
- ◆ Section 169A

- ◆ "Congress hereby declares as a national goal the prevention of **any** future, and the remedying of **any** existing impairment of visibility in mandatory class I Federal areas...."



"Visibility Impairment" (1977)

- ◆ "reduction in visual range"
- ◆ "atmospheric discoloration"







Clean Air Act (1990)

- ◆ Section 169B
- ◆ Conduct research, including modeling
- ◆ Establish “Visibility Transport Regions and Commissions”
- ◆ Establish “Grand Canyon Visibility Transport Commission” (GCVTC)

GCVTC Final Report (1996)

"Air pollution prevention and reduction of per capita pollution is a high priority for the Commission. The Commission recommends policies based on energy conservation, increased energy efficiency and promotion of the use of renewable resources for energy production."

GCVTC's "10/20" Goal

"The goal of the states in the Transport Region should be to achieve annual additions in order that renewables will comprise 10% of the regional power needs by 2005 and 20% by 2015."

EPA's Regional Haze Rule (1999)

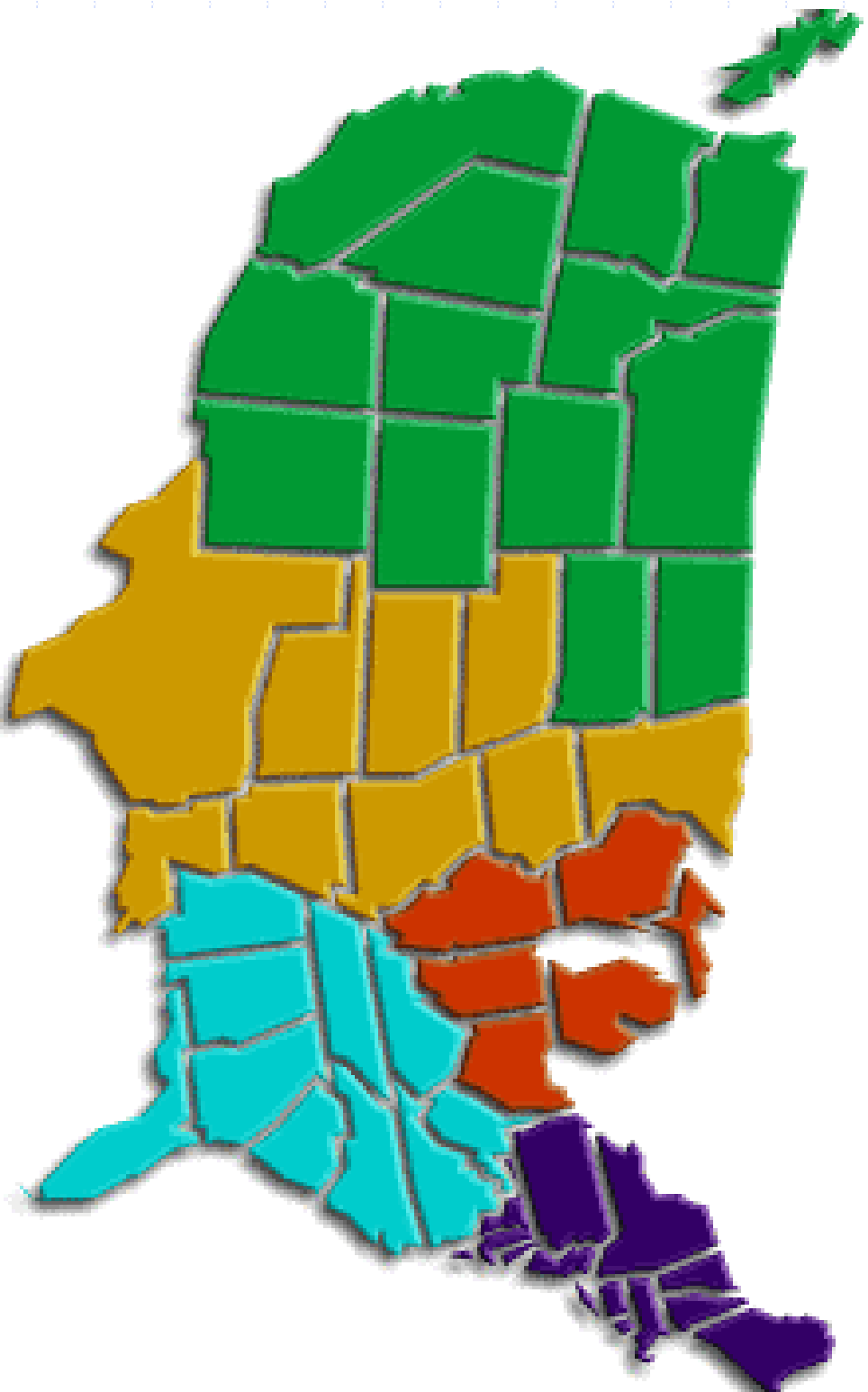
- ◆ Requires "Annex" to define regional SO₂ emission milestones to achieve "greater reasonable progress than Best Available Retrofit Technology (BART)."
- ◆ Documentation regarding how the GCVTC (WRAP) will meet the "10/20" goal or why it's not feasible.

EPA's RHR – Long-term Goal

- ◆ Analyze and determine the rate of progress (“uniform rate of visibility improvement”) needed to attain natural haze conditions by the year 2064.
- ◆ Determine emission reductions needed to achieve this progress and whether these are reasonable.

Regional Planning Organizations

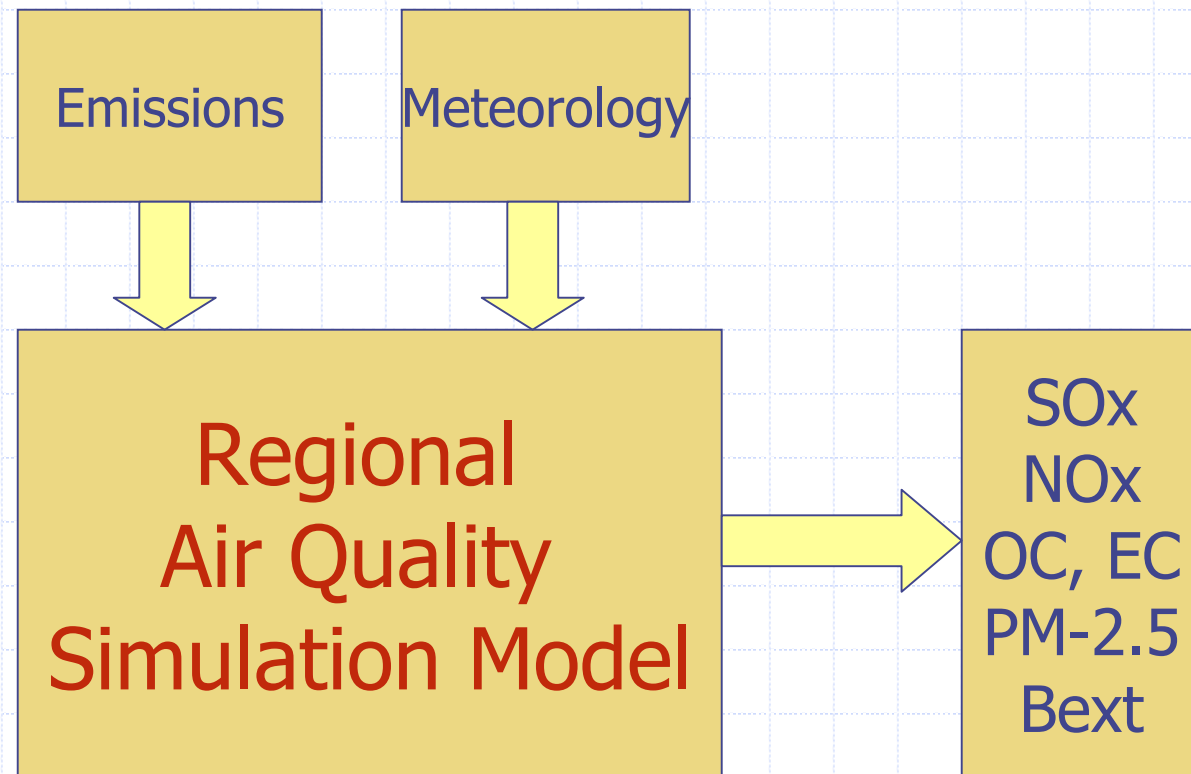
WRAP CENRAP Midwest RPO MAINE-VU VISTAS



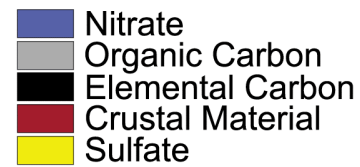
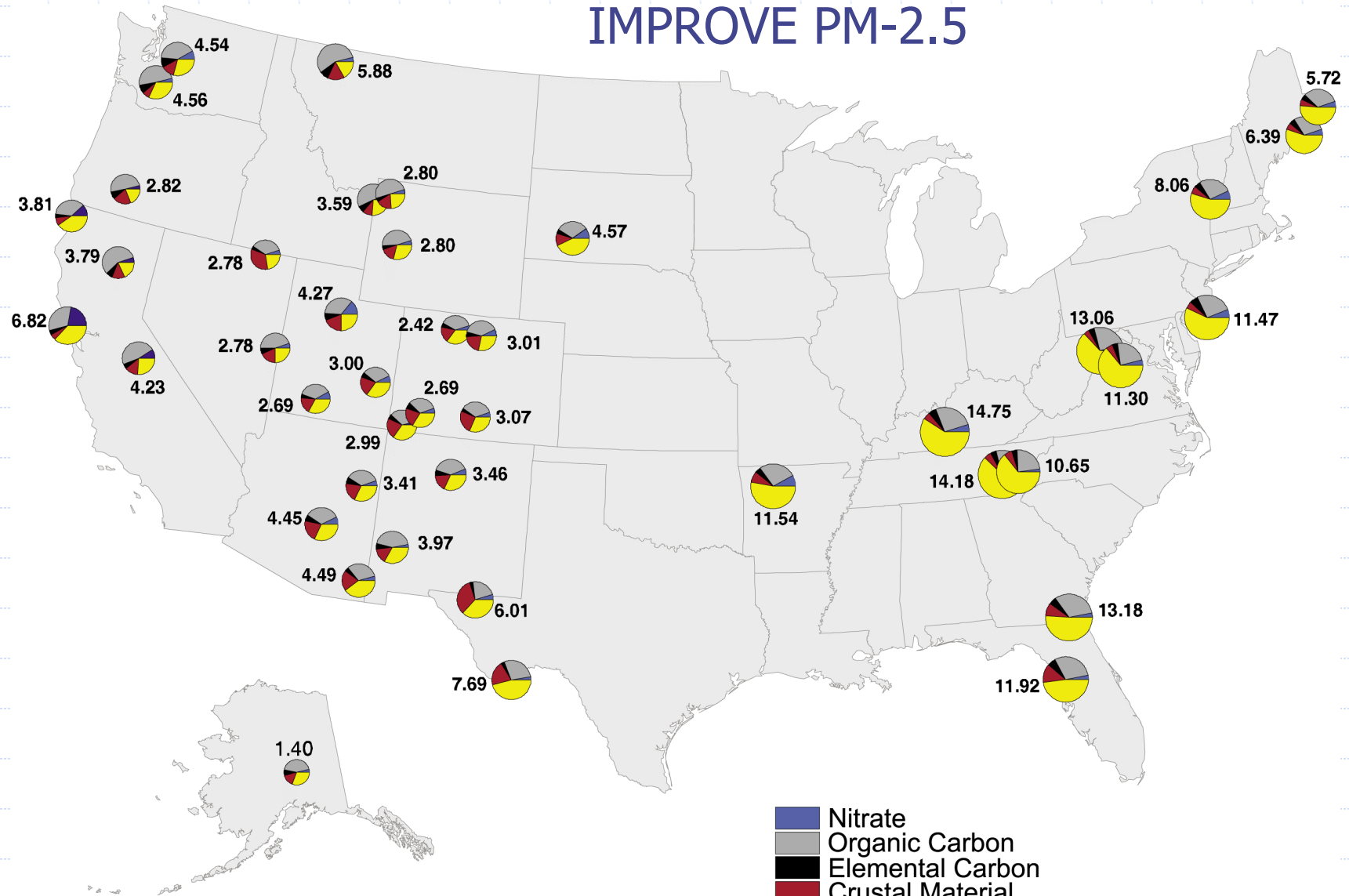


GCVTC/WRAP
"Transport Region"

Regional Haze Modeling



IMPROVE PM-2.5

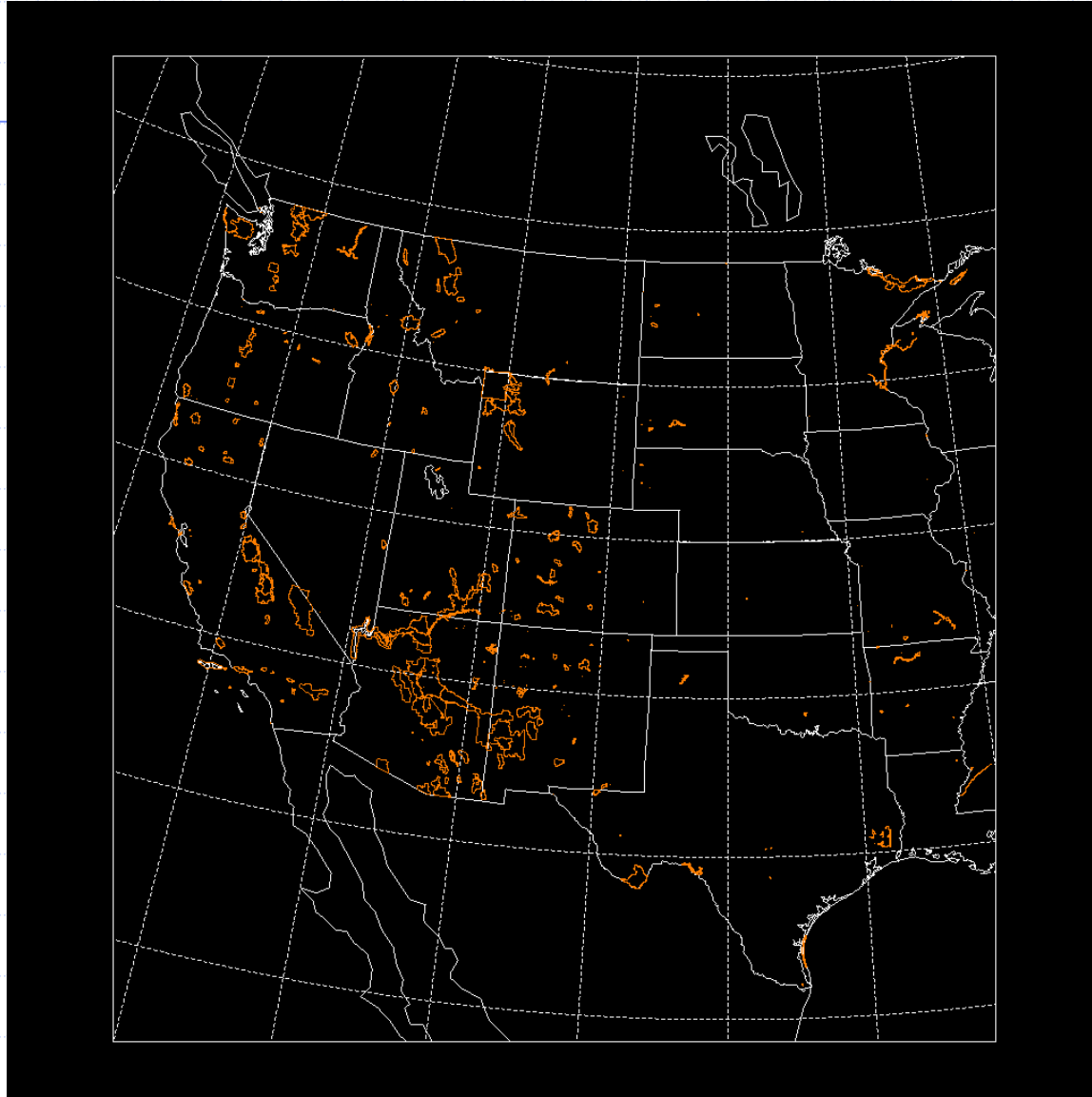


National Academy of Sciences (1993)

- ◆ Committee on Haze in National Parks and Wilderness Areas
- ◆ "... the best approach ... is a nested progression from simpler and more direct models to more complex and detailed methods."

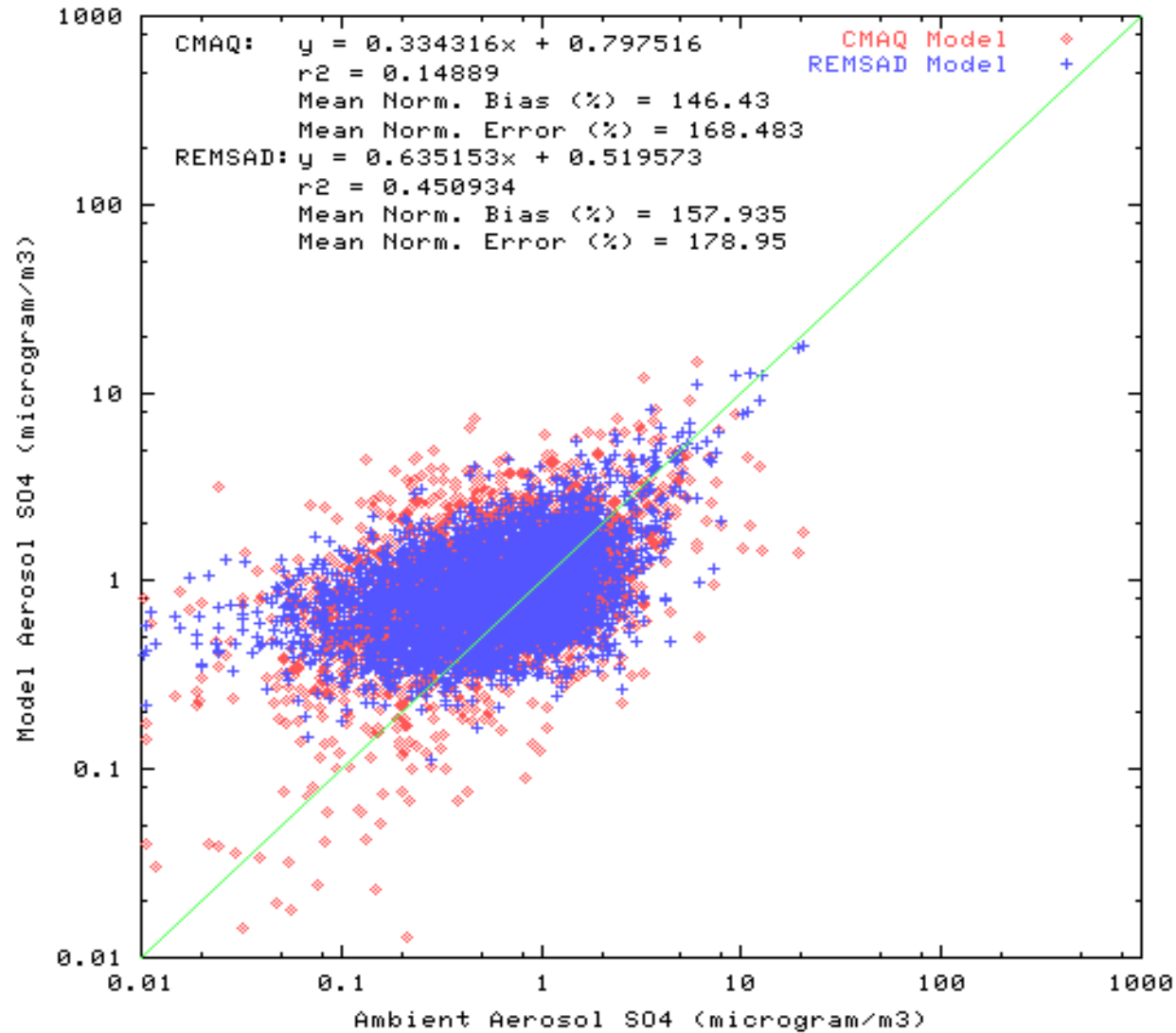
Hierarchy of Models

- ◆ Box models
- ◆ Speciated linear roll-back (NAS)
- ◆ Reduced-form models (S-R Matrix)
- ◆ REMSAD
- ◆ CMAQ



WRAP CMAQ Modeling Domain

Ambient vs. CMAQ/REMSAD Model Aerosol S04 at 55 stations for all days



Sulfate

GIGO: Still Often Overlooked

- ◆ Emission Uncertainties
- ◆ Motor vehicle emissions underestimated
- ◆ Ammonia and fugitive dust emissions
- ◆ Elemental and organic carbon
- ◆ Do we have confidence that existing emissions will be reduced?

Hunter Lovins:

“An approximate **correct** answer is better than a precise **wrong** answer.”